USGS

WATER RESOURCES RESEARCH GRANT PROPOSAL

TITLE: SALINITY MANAGEMENT IN WESTERN WETLANDS: EFFECTS OF IRRIGATED AGRICULTURE ON AVIAN DIVERSITY

DURATION: September 1997- July 2000

FEDERAL FUNDS REQUESTED: $122,936

NON-FEDERAL FUNDS: $245,875

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CRITICAL WATER PROBLEM ADDRESSED BY THE RESEARCH:

One-fourth of the world's wetlands are gone (Williams 1990). More than 50% (22 million ha) of all wetlands in the United States have been lost since 1780 (Dahl 1990). Losses have been particularly severe in the arid west' e.g., half of Nevada's wet lands and 90% of northern Nevada wetlands have been lost over the last 200 years (Dahl 1990). These losses have dramatically reduced formerly diverse assemblages of millions of waterfowl and shorebirds, including numerous species currently considered thre atened or endangered. Now wetland bird populations are further threatened because more than half of remaining western wetlands (Hallock and Hallock 1993) are highly likely to suffer salinization as a result of agricultural (and urban) use and reuse of wa ter. Salinization is likely to harm wetland bird populations through reproductive failure brought on by more regulatory stress, reduced diet diversity, and energetic costs resulting from the need to visit fresh water. New agricultural methods of water con servation and reuse, designed to reduce conflicts between agriculture and wetland reserves, will increase soil and wetland water salinity, thereby accelerating conflict over access to first-use (fresh) water. The implications of soil salinization for agri culture have long been considered. However, water salinization effects on wetlands are an overlooked, but potentially disastrous threat to avian biodiversity.

Effective water allocation by public policymakers will require an understanding of the impacts of salinity on wetland bird populations. As human populations of western states expand, fresh water will become an ever-more precious resource, and conflict over its use

will increase. If we are to preserve remaining wetland bird populations along with productive urban and agricultural water uses, we must understand the effects of salinization. Without this knowledge, wetland bird habitat restoration and reme diation, (such as that mandated under Section 404 of the Clean Water Act or Public Law 101-618, The Truckee-Carson-Pyramid Lake Water Rights Settlement Act, 1990) may fail to meet public needs. Restoration might create unsuitable habitat and exacerbate th e problem, or might divert unnecessary amounts of flesh water that could be put to other uses. Because high quality cannot be maintained for all water, specific salinity standards for wetland bird habitat will be vital for effective water management.

RESULTS AND BENEFITS OF THE RESEARCH:

The results of this research will contribute to the maintenance of avian diversity in the arid west by using specific information about avian salt tolerance to establish wetland salinity standards. Research proposed will provide specific information on the physiological and behavioral ability of wetland birds to compensate for salt loading, and provide biologically-based salinity guidelines for wetland reserve and remediation design. Integration of laboratory and field analyses will allow us to determi ne to what extent birds use freshwater inflows to reduce salinity costs. Surveys of bird use of wetlands at our field site and elsewhere in the Great Basin will allow us to predict the extent to which sub-optimal salinity conditions can be ameliorated wit h limited freshwater inflows, as well as determining the temporal and spatial scales at which such inflows must be delivered in order to effectively support breeding birds. The most important impact of this research isthat it will provide objectiv e information for conflict resolution between agriculture and wildlife values.As natural wetlands disappear, wildlife reserves and remediation sites will become critical as centers of diversity for birds and other wildlife. Concrete understanding of the effects of salinity on wildlife will allow development of salinity standards and management practices for wetlands, and will allow wetland managers to provide the best habitat possible while minimizing the use of fresh water. Western water managers will be able to optimally allocate first-use (fresh) water to meet environmental, urban, and agricultural needs.